

2014 Maryland FMP Report (September 2015)

Section 7. Blue Crab (*Callinectes sapidus*)

Based on the female-specific biological reference points that were adopted in 2011 the Chesapeake Bay blue crab stock is not overfished and overfishing is not occurring. After being below the abundance threshold of 70 million spawning age female crabs in 2014, the estimated abundance of spawning age female crabs in the Chesapeake Bay at the beginning of the 2015 crabbing season increased to 101 million (Figure 1). Although the abundance of spawning age females is above the threshold it remains below the recommended abundance target of 215 million crabs. Conservative management measures have been continued as a risk-averse approach to protect the stock.

Status of Chesapeake Bay Blue Crab Management

The Chesapeake Bay Program (CBP) adopted a Blue Crab Fishery Management Plan (BC FMP) in 1989. The plan was revised in 1997 with the following objectives: provide long-term protection for the blue crab stock and maintain a stable stock; establish quantitative targets (such as abundance, biomass, or other indices) and biological reference points. In 2003, Amendment #1 to the 1997 CBP Blue Crab FMP was adopted. The purpose of Amendment #1 was to formally adopt biological reference points for managing the resource; to reaffirm strategies for reducing fishing effort; and to recognize the importance of biological monitoring, habitat protection and ecosystem processes. Amendment #2 was developed in 2011 to formally adopt the new female-specific reference points and to recognize the importance of fishery-independent and fishery-dependent monitoring. Amendment #2 was incorporated by reference into Maryland regulation in September 2012. The BC FMP and amendments are scheduled for an in-depth review once the next stock assessment is completed (2017).

Stock Status

The Chesapeake Bay blue crab stock is currently not overfished and overfishing is not occurring. A full stock assessment was completed and peer reviewed in 2011. The 2011 stock assessment used an integrated estimate of management reference points and stock status. Previous stock assessments did not directly link the two parameters. The female-specific biological reference points (BRPs) are based on estimates of age 0+ female crabs (the exploitable stock) and the abundance of age 1+ female crabs (an index of the spawning stock). Recruitment (the estimated number of age 0 crabs – crabs that are less than 60mm or 2.4 inches) increased from 198 million in 2014 to 269 million crabs in 2015. The estimated abundance of spawning age female crabs was 101 million, an increase from 2014. The exploitation fraction was 17% in 2014, below the target (25.5%). The status of the stock from 2012-2015

based on the female-specific target and threshold is found on Table 1. The next stock assessment is scheduled to begin in 2016.

In order to ensure that male abundance does not drop below a critical level relative to female abundance, the Bay jurisdictions developed conservation points of reference for male crabs. The points of reference were updated for 2014 to include a scaling factor that is consistent with the way female BRPs are calculated. The Chesapeake Bay Stock Assessment Committee (CBSAC) recommended the following conservation triggers for male crabs. If the male exploitation rate exceeds 33% or if the female exploitation rate is below 34% and the combined male/female rate exceeds 53%, the Bay jurisdictions should consider conservation measures for male crabs. The male conservation triggers are based on the second highest exploitation value in the time series of data and does not represent a biologically significant parameter. The 2014 estimate of male exploitation was 21% and no management action is recommended for male crabs at this time.¹ Estimates of male exploitation for 2015 cannot be calculated until the completion of the 2015 fishery (December).

The Baywide winter dredge survey (WDS) is the primary indicator of blue crab stock status in Chesapeake Bay. The WDS provides an annual estimate of over-wintering blue crab abundance by age and gender. The abundance of female spawning age crabs (age 1+) is used to determine if the population is overfished. The number of spawning age female crabs increased by 47% in 2015 after being slightly below the threshold in 2014.

Management Measures

A control rule for the blue crab stock has been used to assess the status of the stock since 2001. Control rules describe a variable as a function of another variable that management can influence or have some control over.² Determining the variables depends on the characteristics of the stock and the fishery. These variables are then used to develop definitions of biological reference points, i.e., targets and thresholds. In developing a control rule, the selection of a target is risk-averse even though it is expected that the target may be exceeded because of natural annual variability. Currently, the control rule for blue crabs is based on female spawning stock biomass and exploitation.

In Maryland, catch limits and closed periods are implemented to maintain an allowable female harvest that is associated with the 25.5% exploitation target. The allowable female harvest changes with estimated annual abundance. Maryland DNR determines the allowable harvest and then develops a suite of limits designed to achieve but not exceed the allowable harvest. The crabbing industry provides input on which combinations of limits work best for the industry via the Blue Crab Industry Advisory Committee.

New regulations for recreational crabbing went into effect in 2013. Waterfront property owners must register their crab pots in order to use them from their piers. Anyone using collapsible traps or net rings must obtain a recreational license. A person can use a hand-line or dip net to catch crabs without a license. Refer to the Maryland DNR webpage for more details

<http://dnr2.maryland.gov/fisheries/Pages/regulations/blue-crab.aspx>

In 2014 the estimated abundance of spawning females was just below the minimum safe threshold of 70 million crabs which prompted additional protection for spawning-age females in the fall of 2014 and spring of 2015. Individual daily bushel limits were reduced in April 2015 and additional vessel bushel limits were put into place from September 2014 thru April 2015 to protect mature females. In 2015 the size limit for female peelers was raised from 3¼ inches to 3½ inches from April 1 - July 14th making the minimum size 3½ inches for the entire season in an effort to increase the number of immature females that reach reproductive maturity.

The Fishery

As population levels change, maintaining the exploitation target may result in either an increase or a decrease in harvest. The 2014 baywide (Maryland, Virginia and Potomac River) commercial harvest was approximately 35 million pounds (Figure 2). The percentage of females removed by harvest in 2014 was approximately 17% which was below the recommended target (25.5%) and threshold (34%) (Table 1). Prior to 2008, recreational harvest was assumed to be approximately 8% of the total harvest. Since recreational crabbers can no longer harvest female crabs in Maryland the estimated harvest is now based on 8% of the bay wide male harvest plus 8% of Virginia female harvest for a total of 2.3 million pounds baywide in 2014. Adding up the harvest from each fraction of the harvesting sectors and across the entire Chesapeake Bay, the 2014 total harvest was approximately 37.3 million pounds.¹

Issues/Concerns

Although management measures have successfully kept the exploitation of female crabs below the target and kept abundance above the threshold, conservation measures need to remain in place to ensure that the population continues to increase. The blue crab population is subject to high natural variability from year to year due to overwintering mortality, recruitment (the number of juveniles >60mm), and other unknown variables. These factors emphasize the need to determine an appropriate margin of conservation to account for environmental variability.

Since 2012 a pilot study led by an industry-based group has been testing a new way to accurately report commercial harvest data in a more timely fashion using electronic technology. This is a new co-management approach between the crab harvesters and MDNR. The electronic reporting program includes a “hail-in, hail

out” protocol and random catch verification which should provide improved and timely commercial harvest data. A report on the results of the pilot study is in progress

Maryland has continued with a text messaging system to help watermen stay abreast of blue crab regulations and any seasonal changes that may occur. Watermen can subscribe to receive text message reminders a day or two before a regulation change goes into effect.

Latent effort refers to the number of people holding fishing licenses that have not been actively harvesting crabs but could return to the fishery at any time. This part of the fishery continues to be a management concern. Maryland and Virginia have been successful at reducing the number of people holding crabbing licenses through a federally funded license buy-back program in 2009 and 2010. The number of inactive licenses needs to be monitored and additional recommendations formulated. New methods for calculating recreational catch and effort is also needed to fully characterize total removals by the fishery.

Maryland DNR received federal disaster funding in 2008 to assist management efforts and to mitigate impacts to watermen from a declining blue crab fishery. The Maryland General Assembly also directed capital funding towards the efforts. Funding has been used for buying back commercial blue crab licenses; evaluating alternative management systems for the blue crab fishery; providing quality assurance of crabmeat products; creating new marketing programs and economic opportunities; removing derelict (ghost) pots; and seeking sustainability certification for the blue crab fishery and industry. The federal disaster grant ended in Sept. 2014.

As part of the Sustainable Fisheries goals in the Chesapeake Watershed Agreement (June 2014), a blue crab abundance and management outcome was developed. It states: “Maintain a sustainable blue crab population based on the current 2012 target of 215 million adult females. Refine population targets through 2025 based on best available science.” The bay jurisdictions have developed a management strategy to achieve the outcome and are developing biennial work plans by 2016.

http://www.chesapeakebay.net/managementstrategies/strategy/blue_crab_abundance_and_management

Enforcement

The enforcement of commercial and recreational fishing regulations is critical to management success. Some of the federal disaster money has been directed to improving enforcement of blue crab conservation/management measures. In Maryland, the Natural Resource Police (NRP) hired additional officers to provide a dedicated enforcement effort for crab management. The NRP has successfully increased the total number of enforcement hours and initiated a targeted enforcement

protocol through a program called “Don’t Get Pinched.” In addition, there have been increased penalties for offenses and improved judicial action.

Conclusion

The Bay jurisdictions will continue to investigate alternative strategies to improve management of the blue crab resource in 2015. In preparation for the new stock assessment the jurisdictions have determined terms of reference and will consider the development of abundance-based variable targets and thresholds. Although steps have been made to improve harvest accountability and reporting for both the commercial and recreational fisheries, more improvements are needed. Since female abundance is not at target levels, the jurisdictions need to maintain conservative management measures and make adjustments to ensure that harvest levels are commensurate with abundance indices.

References

- ¹ Chesapeake Bay Stock Assessment Committee (CBSAC). 2014 Chesapeake Bay Blue Crab Advisory Report, June 2014.
- ² Miller, T., Wilberg, M., Davis, G., Sharov, A., Colton, A., Lipcius, R., Ralph, G., Johnson, E., and Kaufman, A. 2011. Stock Assessment of the Blue Crab in Chesapeake Bay. Tech. Rept. Series No. TS-614-11 of the University of Maryland Center for Environmental Science
- ³ Restrepo, V. and J. Powers. 1999. Precautionary control rules in US fisheries management: specification and performance. ICES Journal of Marine Science, 56:846-852

Table 1. Female-specific biological reference points and status of the blue crab stock, 2011-2015

Reference Points			Stock Status				
	Target	Threshold	2011	2012	2013	2014	2015
Female-specific Exploitation Fraction	25.5%	34% (max)	24%	10%	23%	17%	TBD*
Abundance (millions of female crabs)	215	70 (min)	190	97	147	68.5	101

(2015 Chesapeake Bay Blue Crab Advisory Report)

*Exploitation fraction cannot be calculated until the 2015 harvest data is complete

Figure 1. Estimated abundance of spawning age female crabs (age 1+) in Chesapeake Bay, 1990-2015

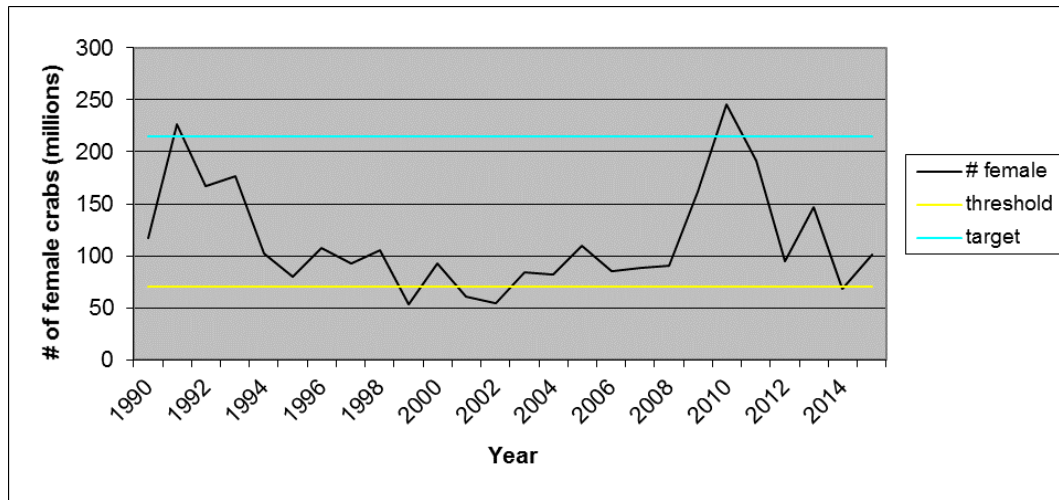
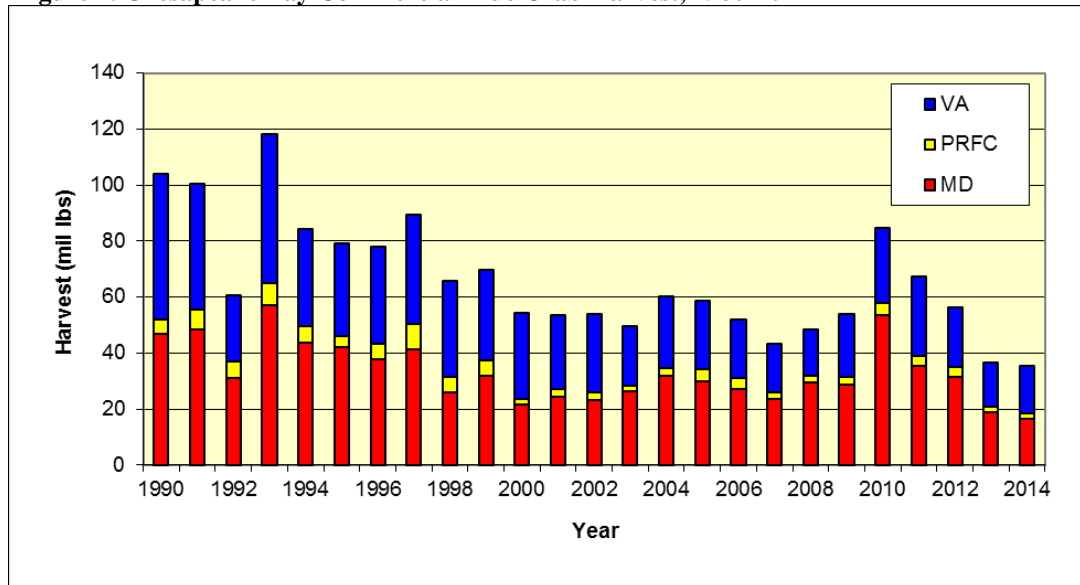


Figure 2. Chesapeake Bay Commercial Blue Crab Harvest, 1980-2014



2003 Chesapeake Bay Program Blue Crab Fishery Management Plan Amendment 1 (updated 09/2015)			
Problem Area	Action	Date	Comments
Stock Status Strategy Chesapeake Bay stock has stabilized at historically low levels but continues to be at risk for recruitment failure.	Action 1 CBP jurisdictions will adopt a threshold fishing mortality rate that preserves 10% of the blue crab spawning potential, relative to an unfished stock, and a minimum stock size threshold.	Began in 2001; formally adopted in 2003 2011 Continue 2015	The 2005 Stock Assessment recommended using the exploitation fraction (the proportion of the vulnerable population that is harvested each year) instead of F for evaluating BRPs. The 2010 exploitation estimate was below the threshold and has been below the threshold since 2008. As a result of the 2011 stock assessment, new female-specific targets and thresholds were adopted. The new female target and threshold are 215 million female crabs and 70 million female crabs, respectively. Female abundance (101 million crabs) is currently above the threshold level but below the target level. A new stock assessment is scheduled to begin in 2016.
	Action 2 CBP jurisdictions will adopt a target fishing mortality of F_{20} , which if achieved, will increase the blue crab spawning potential from 10% to 20% relative to that of an unfished stock.	Began in 2001; formally adopted in 2003 Continue 2014	The target fishing mortality (F) was replaced by the exploitation target of 46%. As a result of the 2011 stock assessment results, the female-specific exploitation target and threshold are 25.5% and 34%, respectively. The 2014 female-specific exploitation was 17%, below the target level. An exploitation fraction for 2015 cannot be calculated until the completion of the 2015 fishery (December 2015).
	Action 3 CBP jurisdictions will develop control rules based on the biological reference points (BRPs) for managing the blue crab resource. (The control rule was adopted in 2001 and updated in the 2005 stock assessment. It represents the relationship between adult crab abundance, exploitation and management reference points. The 2011 control rule is a major improvement over the previous model because it integrated the calculation of reference points within the model rather than using two separate processes as in the 2005 assessment.)	2003 2005 2006 2008 2011 On-going	In 2006 the overfishing limit was defined as 86 million age 1+ crabs (threshold value). An interim target of 200 million age 1+ crabs was established in 2008. The blue crab stock was not overfished in 2010. In 2015, based on the female-specific BRPs adopted in 2011, the blue crab stock is not overfished and overfishing is not occurring.

Problem Area	Action	Date	Comments
	Action 4 CBP jurisdictions will utilize the results of fishery-independent surveys to determine stock status.	On going	Results of the 2014-2015 Winter Dredge Survey (WDS) indicated the abundance of female age 1+ crabs was 101 million crabs. Spawning-age crab abundance was above the threshold and considered not overfished.
Fishing Effort Strategy CBP jurisdictions will adjust fishing effort to achieve the adopted BRPs.	Action 5 CBP jurisdictions will reduce the exploitation rate of legal-sized blue crabs to meet the target BRPs.	Began in 2001; continue 2008 2011 2015	The Bay jurisdictions implemented new regulations in 2008 & 2009 to reduce exploitation on female crabs. Harvest regulations have been adjusted as needed to meet the target exploitation rate. In 2011, exploitation rates were changed to female-specific rates. Exploitation rates have been below the target since 2010 (Table 1). The 2014 baywide harvest was 37.3 million lbs. There is a large amount of latent effort in the blue crab fishery (latent effort = fishing effort not currently utilized). In MD there are approximately 6,000 individuals with commercial crab licenses but only about 2,000 are actively crabbing. MD implemented a buy-back program for LCC (limited crab catcher) licensees. VA has also implemented a buy-back program and utilized a reverse auction system. Between 2009 and 2010, MD reduced the LLC by about 700 licensees resulting in about a 35,000 pot reduction in effort. The 2015 Chesapeake Bay Blue Crab Advisory Report recommended further evaluation of latent and active effort.
Monitoring Strategy CBP jurisdictions will collect fishery -dependent and fishery-independent data on blue crab resources.	Action 6 CBP jurisdictions will continue to monitor blue crab resources in the bay and work towards developing a baywide monitoring approach	On going	In 2010/2011, recruitment, as measured by the abundance of age 0 crabs in the WDS, remained low and was below the average recruitment of 258 million crabs. Although the number of juveniles had declined, it was one of the largest juvenile abundance indices since 1998. In

2003 Chesapeake Bay Program Blue Crab Fishery Management Plan Amendment 1 (updated 09/2015)			
Problem Area	Action	Date	Comments
			2011/2012, recruitment was the highest on record but declined by almost 50% the following year (2012-2013). WDS results indicate that recruitment increased from 198 million age 0 crabs in 2014 to 269 million crabs in 2015.
Habitat Strategy CBP jurisdictions will identify and protect critical blue crab habitat.	Action 7 MD and VA will consider designating additional sanctuary areas to protect blue crab habitat based on new research data.	Continue	Closure of the VA blue crab spawning sanctuary (928 square miles) was extended an additional month (May-Sept) to protect female crabs. The EBFM life history brief indicates that blue crabs occupy a wide range of estuarine habitats and utilize a series of habitats sequentially along a salinity gradient.
	Action 8 CBP jurisdictions will continue to protect SAV in potential, post-larval settlement areas.	Continue	Sav beds in near shore habitats provide essential habitat for blue crabs, especially during their post larval and juvenile stages. SAVs provide critical shelter for many key species besides crabs. SAVs help improve water clarity, add oxygen to the water, and reduce shoreline erosion.

2003 Chesapeake Bay Program Blue Crab Fishery Management Plan Amendment 1 (updated 09/2015)

Problem Area	Action	Date	Comments
	<p>Action 9 CBP jurisdictions will restore and protect SAV in the Chesapeake Bay to achieve the new goal of 185,000 acres by 2010.</p>	<p>Continue</p> <p>2014</p>	<p>Actions have been identified by CBP jurisdictions to achieve this goal, including the attainment of water quality in shallow-water bay grass designated use areas.</p> <p>In 2014, there were an estimated 75,835 acres of underwater grasses in the Chesapeake Bay, an increase by 27%. SAVs were mapped using 4 salinity zones rather than geographic zones. The change to salinity zones better reflects SAV community types and species composition. For a more detailed description of current and historic status, go to: http://web.vims.edu/bio/sav/sav14/exec_summary.html</p> <p>In the Chesapeake Watershed Agreement (June 2014), the SAV goal/outcome was adjusted to reflect a more reasonable timeframe. The outcome states: “Sustain and increase the habitat benefits of SAV in the Chesapeake Bay. Achieve and sustain the ultimate outcome of 185,000 acres of SAV bay-wide necessary for a restored Bay. Progress toward this ultimate outcome will be measured against a target of 90,000 acres by 2017 and 130,000 acres by 2025.”</p>
	<p>Action 10 CBP jurisdictions recognize the value of salt marsh-fringed habitats and will promote the protection and restoration of marsh-fringed shorelines, creeks and coves</p>	<p>Continue</p>	<p>Salt marsh habitats protect molting blue crabs and support many other prey species. These areas are susceptible to shoreline development and should be protected.</p>

2003 Chesapeake Bay Program Blue Crab Fishery Management Plan Amendment 1 (updated 09/2015)

Problem Area	Action	Date	Comments
Ecosystem strategy CBP jurisdictions will incorporate information on ecosystem processes relating to blue crabs as it becomes available and utilize the information to determine management actions as necessary	Action 11 Utilize the guidelines from the Fisheries Ecosystem Plan (FEP) to incorporate multi-species and ecosystem considerations into existing CBP fishery management plans.	Began 2005 Continue	A new EBFM operational structure was facilitated through MSG. An EBFM blue crab species team was formed in late 2008. The team completed biological briefs on important blue crab issues. This information is available at http://www.mdsg.umd.edu/programs/policy/ebfm/ The recommendation from the group is to use the briefs when the Blue Crab FMP is revised.
	Action 12 As data becomes available on food web dynamics, adjust fishing mortality rates on the blue crab population to include predator and prey needs.	On-going	Blue crabs play an important role in the food web of the bay. They are prey for important species of finfish and are predators on other species such as mollusks. Blue crabs play a key role in the trophic dynamics of the Bay & are considered the foremost benthic consumer in the Bay foodweb.
	Action 13 Evaluate the impact of non-native crab introductions on the blue crab population and develop recommendations accordingly.	On-going	There is concern over the interaction of blue crabs with non-native species of crabs, which include the green, mitten and Japanese shore crab. In 2006 MD adopted regulations that prohibit the transport of green or Japanese crabs. MD also adopted regulations to prohibit the import, transport, purchase, possession, sale or release of mitten crabs. The states have implemented education and outreach programs to highlight the problems associated with invasive species.

Acronyms:

BRP= biological reference points

CBSAC= Chesapeake Bay Stock Assessment Committee

CBP= Chesapeake Bay Program

EBFM = Ecosystem based fisheries management

FMP = Fishery Management Plan

MSG = Maryland Sea Grant

QET = Quantitative Ecosystem Team